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Influence of the Physical Attributes of Boundary Walls on the Perceived Sociability of the Adjoining Public Space

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ABSTRACT

As part of the proliferation of security concerns and privatization of space, the consideration of boundary walls in contributing to the publicness of public spaces is limited to their presence and level of visual accessibility. However, as one of the interstitial configurations of street edges, the enabling capacity of the physical attributes of boundary walls in influencing the perceived sociability of the adjoining space has hardly been investigated. The contribution of boundary walls towards the publicness of public spaces is dependent on the intensity of their physical attributes. Physical features, surface uses, physical access, and visual access conditions are the attributes of boundary walls that not only represent the intended levels of control, but also latently reveal the intrinsic association with the adjoining space. Premised on the interaction between objective and subjective measurements, in this study, these physical attributes of boundary walls are measured in terms of their contribution to the publicness of public spaces, while the perceived sociability of the adjoining space is measured through a questionnaire survey in positive and ambiguous space types. The physical boundaries of eleven positive spaces and twelve ambiguous space types in Tiruchirappalli city in the state of Tamil Nadu, India are identified, and the differences in the perceived sociability of the adjoining spaces are analyzed with respect to the physical attributes of boundary walls and the presence of sidewalk. This study has found that the physical features, surface uses, visual access, and the varying conditions of the abutting space of boundary walls influence the perceived sociability of the adjoining space.

Keywords: boundary walls, sidewalks, publicness, public space, street edges

INTRODUCTION

Boundary walls are vertical spatial markers that are fundamental to the organization of human activities. Proliferation of boundary walls has attracted renewed attention to emerging forms of urbanity (Montgomery, 1998). Even though boundary walls are integral to social life, they are saturated with negative connotations (Flusty, 1997; Low, 1997). But their potential to connect or insulate two distinct spaces indicates the significance of their material and spatial conditions, which simultaneously perform the functions of communicating and demarcating the spaces (Brighenti, 2009; Madanipour, 2003). Their capacity to enable positive qualities of the public spaces (Madanipour, 2010) is the premise on which this research has been formulated.

Boundary walls are implicit in the "growing polarization of urban space" and occupy an important role in the narratives of the loss of publicness (Flusty, 1997; Flusty, 2001; Franzen, 2001, p. 202; Low, 1997; Low, 2001). As hard controls, boundary walls not only explicitly convey the intended levels of control (Brighenti, 2009; Huang, 2012; Marcuse, 1997) but also are implicit in associating with the adjoining space condition. In this regard, the intended level of control is conveyed through the physical attributes of the boundary wall, which is constitutive of the presence of deterring features such as high walls, barbed wire, etc., the presence of warning signs or non-enabling ways of discouraging/deterring the use of the boundary wall surface, physical access restrictions in the form of access controls through security checks, and limiting visual accessibility through blank walls, etc. These physical attributes are intrinsic to the presence of a boundary wall that encloses a space. The contribution of boundary walls towards the publicness of public spaces is dependent on the intensity of their physical attributes. The rigid presence of boundary walls and their inevitable influence on the perception of public spaces is an important consideration in the quality of contemporary public spaces (Carmona, 2010; Nemeth & Schmidt, 2011). In the making of successful public spaces, it is not only the provisions and capacities of material and spatial conditions, but also the perceived sociable qualities that enable both instrumental and expressive functions to be realised (Madanipour, 2003; Madanipour, 2010; Montgomery, 1998; Stevens, 2007). Free-standing boundary walls and ground floor frontages are the only two forms of interstitial configurations at the street edges; while the former is hardly studied, the latter has been extensively investigated (Gehl, 2011; Kickert, 2016; Mehta, 2007). Given the inevitable presence of boundary walls and the significance of the quality of public spaces, surprisingly little attention is paid to the significance of the physical attributes of boundary walls in influencing the perceived sociability of the adjoining space. Studying this association as the interaction between objective and subjective measures (Nemeth & Schmidt, 2011) is a step towards comprehending the enabling capacity of the physical attributes of the boundary walls of public spaces.

Successful public spaces are a universal prerequisite for vibrant public life (Montgomery, 1998; Pugalis, 2009). Even though narratives regarding publicness of public spaces focus on western contexts, boundary walls are ubiquitous, and the role of their physical attributes is subject to the utilization by people, governments and private corporations (Almatarneh & Mansour, 2013; Brighenti, 2009; Brighenti, 2010; Marcuse, 1997). Given the fact that cities across the world are going through the "same global urban processes" of privatizing urban space, studies from eastern contexts enhance the understanding of material and spatial conditions of public spaces that are not only relevant to academic scholars, but also to officials and professionals (Kim, 2012; Madanipour, 2010, p. 14). This study aims to comprehend the interaction between perceived sociability of adjoining spaces and the physical attributes of the boundary walls of public spaces in Tiruchirappalli city, India.

LITERATURE REVIEW

The presence of boundary walls represents not only property ownership, but also social conditions (Marcuse, 1997; Rashid, 1998). They are not inert and isolated entities that are devoid of interactions; instead, they primarily belong to the domain of architecture and functionally transcend the geographical, legal, social, and

cultural dimensions of a settlement. Hard and soft controls, fearscapes, and loss of publicness are central concepts in which role of boundary walls is apparent (Carmona, 2010; Nemeth & Schmidt, 2011; Tulumello, 2015; Varna, 2014). The presence of boundary walls is considered to be discouraging and indicative of something to be avoided since they tend to contribute negatively to the publicness of public spaces (Nemeth & Schmidt, 2011; Varna, 2014). According to Madanipour (2003), perimeter articulation of the enclosed space and edge conditions of the continuous space (sidewalk) converge into boundary walls, leading to their ambiguous role. Boundary walls can insulate or connect; both properties carry mutually inherent enabling and non-enabling conditions. Under the ambit of ownership, the side of the wall facing the public space is not just a material representation of enclosure and (blank) interface, but a place that can potentially induce social life into streets (Alexander et al., 1977; Dovey & Wood, 2015). In this regard, edge conditions of streets are places of intense social interaction wherein boundary walls, acting as fulcrums of power relations, assume an additional significance, particularly as micro-elements that "shape behaviour, control access and manage different social groups" (Madanipour, 2003, p. 210).

Emphasizing social hierarchies, Marcuse (1997) suggests ramparts, stockades, stucco walls, barricades, and prison walls as five types of boundary walls. The social function of boundary walls is inherently constitutive of physical characteristics, and any application of the types of boundary walls to empirical investigation demands a more fine-grained division of the physical composition of boundary walls. According to Brighenti (2009) materiality of walls can be understood as technology with which physical boundaries are drawn. In this regard, barbed wire is one of the "highly influential technology" for deterrence (Netz, 2004, p. xii). The role of a wall negotiates between its physical qualities and affective qualities, the former to control and deter, whereas the latter creates possibilities for interaction and communication, which can be either encouraging or discouraging (Brighenti, 2009). Boundary walls possess the capacity to generate various visibilities, wherein their surfaces enable public address by means of posters, fliers, advertisements, political messages, and public art (Brighenti, 2009; Hoek, 2016). Apart from the significance of physical features and surface uses, Madanipour (2003, p. 56) states that the physical access and visual access conditions of boundary walls are essential attributes that are instrumental in "creating managed environments". In this regard, even though boundary walls are reflective of ownership, control, access, use, and civility dimensions of a public space (Saisanath & Subbaiyan, 2020) their presence is primarily constitutive of physical features, surface uses, physical access, and visual access conditions, wherein *physical features* represent material expressions realized in the form of bollards, hedges, fences, spikes, walls, barbed wire, etc. *Surface uses* represent various uses the surfaces of the boundary walls are subjected to, such as, but not limited to posters, fliers, public art, etc. *Physical access* represents the level of restrictions installed to access a place, and *visual access* represents the level of visual permeability of the boundary wall. Further, as a free-standing architectural element, boundary walls not only enclose a space, but also address the adjoining space.

Boundary walls and sociability of adjoining space

As a public space that adjoin the boundary walls, sidewalks are "mundane interstitial spaces" that are part of infrastructure, leisure destinations, and spaces of everyday life (Ehrenfeucht & Loukaitou-Sideris, 2010; Kim, 2012, p. 226). Even though sidewalks are open and continuous spaces that are accessible to all, their level of use and the range of activities that take place in this space are guided by the interests of the abutting properties (Loukaitou-Sideris & Ehrenfeucht, 2009). In this regard, the juncture between enclosed spaces and continuous spaces is mediated by two forms of interstitial configurations: ground floor frontages and free-standing boundary walls. Ground floor frontages and their effect on the adjoining public space regarding behavior and activities have been well explored, even though limited to a western context (Heffernan et al., 2014; Kickert, 2016; Mehta, 2007).

Observation-based studies tend to describe and interpret why certain behaviors take place, indicating "potential publicness", whereas studies that explore user practises and perceptions reveal the existing quality of public spaces, indicating "actual publicness" (Elsheshtawy, 2013; Heffernan et al., 2014; Langstraat & Van Melik, 2013; Nemeth & Schmidt, 2011, p. 12). Further, perceptions of everyday users bring deep insights into prevailing conditions that are not clouded by professional impositions, a crucial insight for making meaningful public spaces (Pugalis, 2009; Stevens, 2007). According to Mehta (2014, p. 58) meaningful public space means the "ability for space to support activity and sociability". Sidewalks as public spaces combine movement with adjoining activities, making them complex spaces that can not only support diversity of urban life through their open and continuous spatial character, but also sustain anonymity and "exchange among strangers" through materiality of the edge conditions (Franzen, 2001; Madanipour, 2003, p. 102).

The varying levels of physical and visual connections of boundary walls not only represent limitations regarding "visibility, communication, contact and movement", but also provide opportunities for non-instrumental, unexpected, and unintentional actions and activities, leading to leisurely, loose, playful, and convivial conditions of the space (Franck & Stevens, 2007; Shaftoe, 2008; Stevens, 2007, p. 115). Leisure is "passive" in nature, whereas play is conceptually related to "non-instrumentality, spatial separation and, publicness" (Stevens, 2007, p. 3). Even though leisure differs from play, they both bring forward the latent potential of boundary walls (Stevens, 2007). By acting on bodies, solid edges "provide something to work with and work against", making the adjoining space loose and ludic (Brighenti, 2009; Franck & Stevens, 2007; Stevens, 2007, p. 202). Boundary walls carry the potential to turn an adjoining space into a sociable space that facilitates a range of uses (Shaftoe, 2008). In this regard, Franck and Stevens (2007, p. 8) state that "walls, fences and ledges, which are often supposed to delimit space and behavior, can be sat upon, climbed onto and used to display banners or items for sale". Using boundary wall surfaces for artistic, political, and commercial expressions and intensions provides the "potential for action" that aids public attention and positive distractions in everyday life (Stevens, 2007, p. 214). Public spaces that support "unintended and unexpected activities" facilitate interaction among strangers, and extension of activities beyond their intended uses is an important ingredient in making successful public spaces (Franck & Stevens, 2007, p. 4; Stevens, 2007). According to Gehl (2011), activities begin from the edges and move towards the center, which is due to the solid background that prevents any sudden encounters from behind, indicating a degree of psychological safety (Shaftoe, 2008; Stevens, 2007). The instrumental and expressive needs of the adjoining space are shaped by the material conditions of the interstitial spaces since the quality of a public space is driven by the physical environment that is supportive of the actions of people (Madanipour, 2003).

Edge conditions of streets in India

The increasing number of gated communities, office campuses, shopping malls, and leisure spaces in India reveals rampant privatisation of space (Vanka, 2014) that is characterized by homogenous security measures. Public spaces in India are an amalgamation of historical, cultural, ethnic, religious, and geographical aspects entangled with pre-colonial, colonial, and post-colonial notions and spatial practices (Vanka, 2014). Studying the perceptions of people in Vizag city of India -- and in particular, exploring how they conceptualize public spaces -- Arefi and Meyers (2003) stated that residents of Vizag city of India identified public spaces in terms of "socio-economic status and land use" in which pollution, crowding, health and religion are seen as the factors that characterize the quality of those public spaces. Further, use of public space in India is a synthesis of user behaviours that stretches across walking, cooking, talking, working, relaxing, reading, eating, sleeping, hanging out, celebrating, and worshipping (Anjaria, 2012, p. 3). In this atmosphere of diverse spatial practices, the significance of physical boundaries emerges from the fact that building edges, boundary walls, sidewalks, and carriage ways fuse together, creating "blurry

conditions" that characterize the public space in India (Shetty, 2012, p. 2).

The interdependence of "material compositions of the street and livelihoods" is an important characteristic of public spaces in India, particularly given the prevailling world-class aspirations and contrasting struggle for subsistence and survival (Anjaria, 2012; Gambetta & Bandyopadhyay, 2012, p. 4; Mani, 2012; Vanka, 2014). Official recognition of street vendors and their spatial accommodation as part of sidewalks is implicit with the presence of boundary walls (Indian Road Congress, 2012). Considering informal activities as encroachments, Patil and Dongre (2014, p. 56) defined properties of the edges in terms of their "deadness". Solid boundary walls contribute to the emergence of encroachments, and since majority of informal activities aim to attract pedestrians, they accommodate themselves on the adjoining spaces of the boundary walls (Patil & Dongre, 2014). Even though the informal and the unplanned are categorized as encroachments, the carefully planned and designed schemes of things are intrinsically loose and ludic (Franck & Stevens, 2007; Stevens, 2007). Further, Shetty (2012, p. 4) is of the opinion that those who favor formal spatial practises "find it difficult to map the blurred relationships between the edge of the street (a public property) and the plot (a private property) adjoining it". In this regard, Madanipour (2010) states that public spaces are shaped by both the presence and absence of spatial claims, the former manifesting in terms of encroachments, and the latter as withdrawal from the public open spaces. The socio-spatial qualities of urban spaces are contingent upon "the interface provided by the configuration of the intervening boundary" (Dovey & Wood, 2015; Rashid, 1998, p. 42). In fact, the role of boundary walls is significant not only as part of the instrumental uses of spatial demarcation, but also as part of the expressive uses of everyday blurriness, the former as a means to an end, and the latter "to project and explore identity" (Madanipour, 2010, p. 238; Yacobi et al., 2016). This ambiguous role of boundary walls, particularly in enabling the instrumental and expressive uses along the abutting spaces, resonates with the notion of interfaces advocated by Jacobs (1961) as places with functional intensity.

Concerning the changing quality of public spaces in the present times of privatization, Carmona (2010) identifies over management of public spaces and under management of public spaces as two notions that are central to the scholarly debates about public space conceptualization, both theoretically and practically. Based on this, Carmona (2010) proposes a four-part contemporary public space typology that is constitutive of positive spaces, negative spaces, ambiguous spaces, and private spaces. Positive space types are natural/semi-natural open spaces, civic spaces, and public open spaces such as parks; negative space types are left over spaces, spaces for vehicles, and spaces designed without function; ambiguous spaces differ in ownership, but have ambiguity in delineation with respect to public and private functions; private spaces are absolute private spaces that are both internal spaces and external spaces. This four-part contemporary public space typology is a continuum from clearly public to clearly private that is underpinned by ownership, function, and perception of spaces (Table 1). These broad public space types are indicative of the presence of various management approaches that either increase or decrease the quality of public spaces (Carmona, 2010).

Table 1

Contemporary public space typology by Carmona (2010)

POSITIVE SPACES*
1. Natural/semi-natural urban space - *Rivers, natural features, seafronts, canals*
2. Civic space - *Streets, squares, promenades*
3. Public open space* - *Parks, gardens, commons, urban forests, cemeteries*
NEGATIVE SPACES
4. Movement space - *Main roads, motorways, railways, underpasses*
5. Service space - *Car parks, service yards*
6. Left over space – *SLOAP (space left over after planning)*
7. Undefined space - *Redevelopment space, abandoned space, transient space*
AMBIGUOUS SPACES*
8. Interchange space - *Metros, bus interchanges, railway stations, bus/tram stops*
9. Public private space* - *Privately owned civic space, business parks*
10. Conspicuous spaces - *Cul-de-sacs, dummy gated enclaves*
11. Internalized public space* - *Shopping/leisure malls, Mega structures*
12. Retail space - *Shops, covered markets, petrol stations*
13. Third place spaces* - *Cafes, restaurants, libraries, town halls*
14. Private public space* - *Institutional grounds, university campuses*
15. Visible private space - *Front gardens, allotments, gated squares*
16. Interface spaces - *Street cafes, private pavement space*
17. User selecting spaces* – *Skate parks, playgrounds, sports fields*
PRIVATE SPACES
18. Private open space - *Urban agricultural remnants, private woodlands*
19. External private space - *Gated streets/enclaves, private gardens*
20. Internal private space - *Offices, houses, etc.*

As public spaces streets are more than movement spaces, they become places by enabling various activities (Franzen, 2001). In this regard, Yacobi et al. (2016) are of the opinion that even though street edges are continuous open spaces that support diversity of public life, the material conditions of the abutting properties have become representative of insulation for private life, affordability, and homogeneity. Privatization of space has become synonymous with commodification of public space, leading to social fragmentation and "voluntary exclusion" (Carmona et al., 2003, p. 119; Franzen, 2001; Madanipour, 2003). Border control mechanisms such as boundary walls are being used to assert control on adjoining spaces, leading to the predominance of familiarity and predictability, as opposed to the quality of anonymity and interaction among strangers (Franzen, 2001). In the present times of proliferating security concerns, Jacobs' (1961, p. 259) remark about boundary walls performing as "border vacuums" is highly relevant, particularly to understand the functional effects of boundary walls as compared to their imagery and aesthetic considerations. Given the necessity of encouraging and enabling the presence of people, activities, and uses along physical boundaries that can define, interact, and insulate the activities on both sides, comprehending the role of the physical attributes of boundary walls in affecting the sociability of the adjoining space is a prerequisite (Brighenti, 2009; Franck & Stevens, 2007; Stevens, 2007). Further, it should be noted that boundary walls are common across many urban space types; as interstitial elements, they belong to "both spheres" and act as "generator and container" of activities (Madanipour, 2003, p. 9). In this regard, to analyze the significance of the physical attributes of boundary walls on adjoining spaces, this study investigates the boundary walls of contemporary public spaces (Carmona, 2010), particularly positive and ambiguous space types since they are constitutive of free-standing boundary walls that enclose various functions and ownerships. This

paper reports the differences in the perceived sociability of the adjoining space with respect to the physical features, surface uses, visual access, and adjoining space condition of the boundary walls in positive and ambiguous space types.

METHODOLOGY

This study investigates the significance of the varying types of physical attributes of boundary walls in influencing the perceived sociability of the adjoining space, wherein physical features, surface uses, visual access, and adjoining space conditions are identified as objective facets and are assessed based on their contribution to the publicness of public spaces, while the subjective facet of perceived sociability of the adjoining space is measured through a questionnaire survey. The empirical examination of the objective and subjective facets of boundary walls is situated in Carmona's (2010) positive and ambiguous space types of contemporary public space typology. Even though boundary walls can be identified along a continuum of public and private spaces, their acute presence is highly pronounced in spaces that are open to the general public and spaces open to a specific public.

This study investigates the significance of boundary walls in Tiruchirappalli city, a historic settlement and a metropolitan city in the state of Tamil Nadu, India. Tiruchirappalli city is constitutive of various manufacturing industries and institutes of repute that impart professional education. Seen from the contemporary public space typology, Tiruchirappalli city is predominantly comprised of parks under *positive space types*, left over spaces and utility spaces (area level water tanks, substations, etc.) under *negative space types*, various functions and ownership spaces such as public and private institutional spaces, offices, government buildings, etc. under *ambiguous space types*, and internal spaces formed within the buildings under *private space types*. As in any other city in the global south, Tiruchirappalli city is also characterized by public spaces (sidewalks) that are subject to varying degrees of spatial and material appropriations (Kim, 2012). The physical attributes of boundary walls and their adjoining spaces in Tiruchirappalli city are brought forward through photographic images, as shown in Figure 1 and Figure 2. Considered to be lacking in the provision of public parks, public spaces (including sidewalks) in Tiruchirappalli city are being realized, revamped, and redesigned as part of smart city program (India Smart City Mission, 2015). In order to make vibrant public spaces, certain parks which are underutilized and not well maintained are being redeveloped with a focus on boundary walls and sidewalks as part of creating safer, more accessible, and more sociable public spaces (Times of India, 2019). In this regard, Tiruchirappalli city corporation has identified forty parks, and more than twenty-five of them are now ready for use by the public (Economic Times, 2019). Understanding the role of boundary walls of public space types is highly pertinent, given the need for active public spaces as part of the city's development (Loukaitou-Sideris & Ehrenfeucht, 2009), and, since boundary walls are part of multiple space types, various categories of public spaces based on ownership and function have been identified in Tiruchirappalli city.

In publicness models, the consideration of boundary walls and their connection with adjoining public spaces is limited to their presence and levels of visual accessibility (Langstraat & Van Melik, 2013; Mehta, 2014; Nemeth & Schmidt, 2011; Varna, 2014). Even though boundary walls represent the enclosed space, they inevitably address the adjoining public space also. Following the contemporary public space typology developed by Carmona (2010), twenty-five parks that are at various stages of being revamped are identified under positive space types, and other prominent institutional, open spaces, and sports/playgrounds under ambiguous space types were also identified (Table 2). Of the twenty-five identified positive space types (recently completed parks), eleven were selected that were representative of the varying types of physical features, surface uses, and visual access conditions being investigated in this study. Furthermore, of the twenty-four prominent ambiguous space types, twelve were selected that were representative of the varying types of physical features, surface uses, and visual access conditions.

Figure 1

Boundary walls of the public space types in Tiruchirappalli city, India.

Figure 2

Adjoining space conditions of the boundary walls of the public space types in Tiruchirappalli city, India.

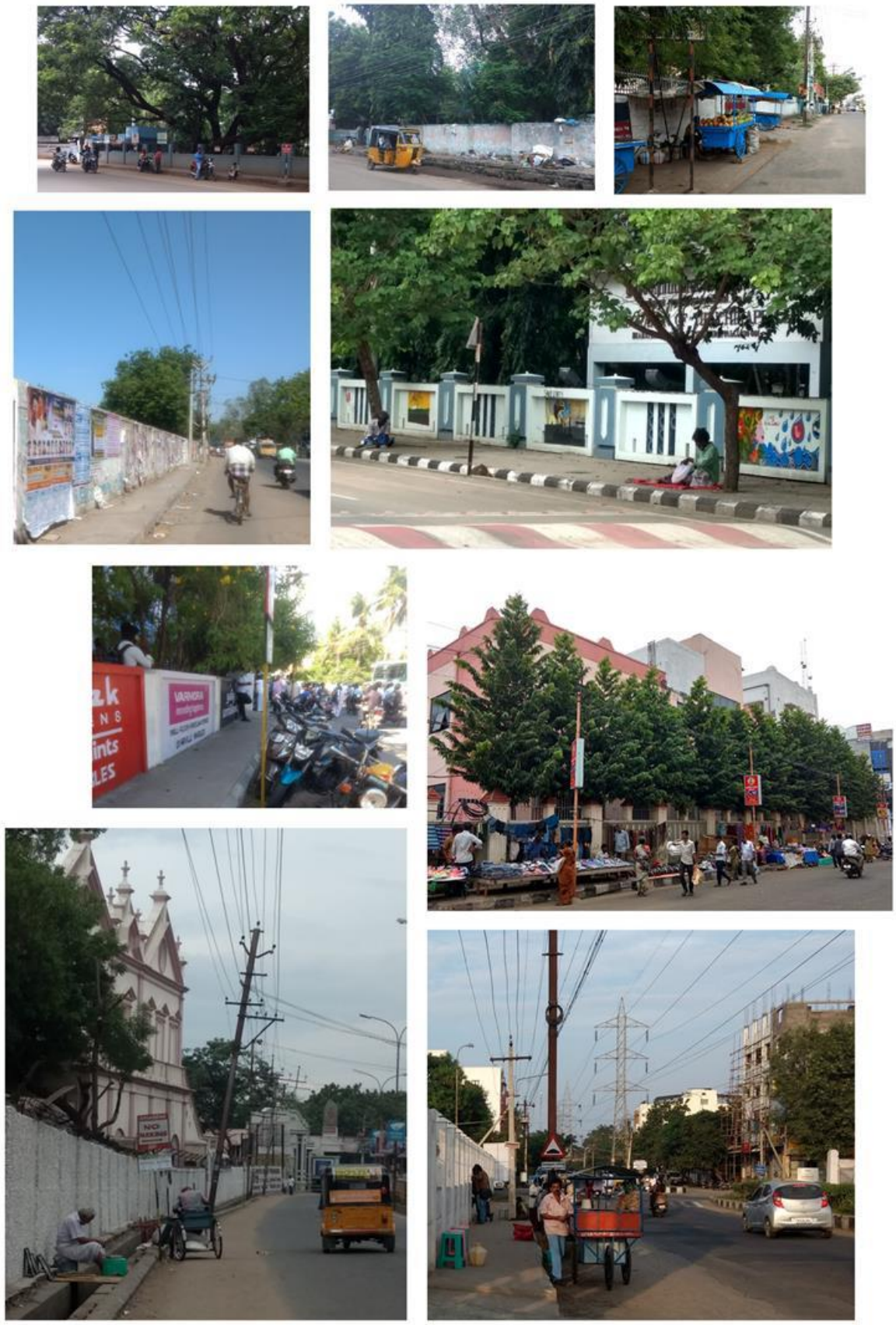


Table 2

Ownership and function of the selected positive space types and ambiguous space types

	Ownership	Function
Positive space types	Public	Park
Ambiguous space type – 01	Quasi-public organization	Institute
Ambiguous space type – 02	Public	Stadium
Ambiguous space type – 03	Private	Institute
Ambiguous space type – 04	Public	Townhall
Ambiguous space type – 05	Public organization	Institute
Ambiguous space type – 06	Public	Exhibition space
Ambiguous space type – 07	Private	Institute
Ambiguous space type – 08	Public	District Central Library
Ambiguous space type – 09	Private	Institute
Ambiguous space type – 10	Public organization	Institute
Ambiguous space type – 11	Public organization	Institute
Ambiguous space type – 12	Quasi-public organization	Institute

Assessing the quality of physical boundaries of public spaces through ownership, control, accessibility, uses and users and civility dimensions reveals the contribution of boundary walls towards the publicness of public spaces (Saisanath & Subbaiyan, 2020). Part of this assessment comprises of physical features, surface uses, physical access, visual access, and adjoining space conditions, which are the defining attributes that shape the edge conditions of the public spaces, and which are central to users' perceptions of the boundary walls. As part of assessing the contribution of boundary walls towards the publicness of public spaces, the physical attributes of the boundary walls are measured in terms of a five-point rating system, an objective measurement, in which the lowest rating of 1 represents lower contribution, and the highest rating of 5 represents higher contribution (Table 3). Since the *physical access* condition of the parks was predominantly uniform, it was not considered for further analysis.

In a study of the perception of public spaces addressed by ground floor frontages, Heffernan et al. (2014) used photographic images and conducted an online questionnaire survey. In this study, it was necessary to collect large number of responses without perceptive bias, so conducting an actual person-to-person questionnaire survey was appropriate (Gillham, 2000). Being a subjective measure, the questionnaire consisted of respondent details and statements regarding the physical attributes of the boundary walls. A five-point Likert scale was used to measure the perceived sociability of the adjoining space of the boundary walls. The format of the statement was – *To what extent do you feel the public space adjoining this physical boundary is: 01=highly unfriendly; 02=unfriendly; 03=neutral; 04=sociable; 05=highly sociable.* Approved by the department-level research committee of the institute, the study was conducted from October 2019 to December 2019. Park users were surveyed during morning and evening hours on weekdays and weekends. Each survey was commenced only after obtaining the consent from the respondent (Figure 3). Out of 495 participants in positive space types, 42.2 percent were between 30 and 44 years of age, 59.8 percent were regular users of the space, 66.9 percent had university level educations, 46.3 percent were working as employees, and 66.9 percent were married. Out of 519 participants in ambiguous space types, 61.8 percent were aged between 15 and 29 years, 85.7 percent were regular users of the space, 69 percent had university level education, 48.6 percent were students, 42.6 percent were working as employees, and 38.7 percent were married. Statistical Package for the Social Sciences (Statistical Package for the Social Sciences, SPSS version 17) was used for the inferential statistical analysis of physical attributes of boundary walls and questionnaire survey responses. The selected positive spaces had three groups under physical features and presence of sidewalk, and four groups under surface uses and visual accessibility of the boundary walls (Table 4). The selected ambiguous spaces had two groups under physical features, four groups under surface uses and presence of sidewalk, and three groups under visual accessibility of boundary walls (Table 5).

Table 3

Measuring the physical features, surface uses, visual access, and presence of sidewalk abutting the boundary walls of public spaces in Tiruchirappalli city, India.

	Physical features	Surface uses	Visual Access	Presence of Sidewalk
1	Free-standing wall with deterring features	Non-enabling surfaces / Blank surfaces	Visually inaccessible	No sidewalk but open drain / left over space
2	Only wall	Unauthorized surface uses	Less than one-fourth visual access	Sidewalk present but broken and inaccessible
3	Only spikes	Authorized and unauthorized surface uses	More than half visual access	No sidewalk but only road
4	Only chain link fence	Surface uses by owner	More than three-fourth visual access	Sidewalk present but for pedestrians only
5	Bollards / block-hedge	Surface uses for public art	Complete visual access	Sidewalk present and is accessible to all

Figure 3

Map showing the location of selected positive and ambiguous space types in Tiruchirappalli city, Tamil Nadu, India.

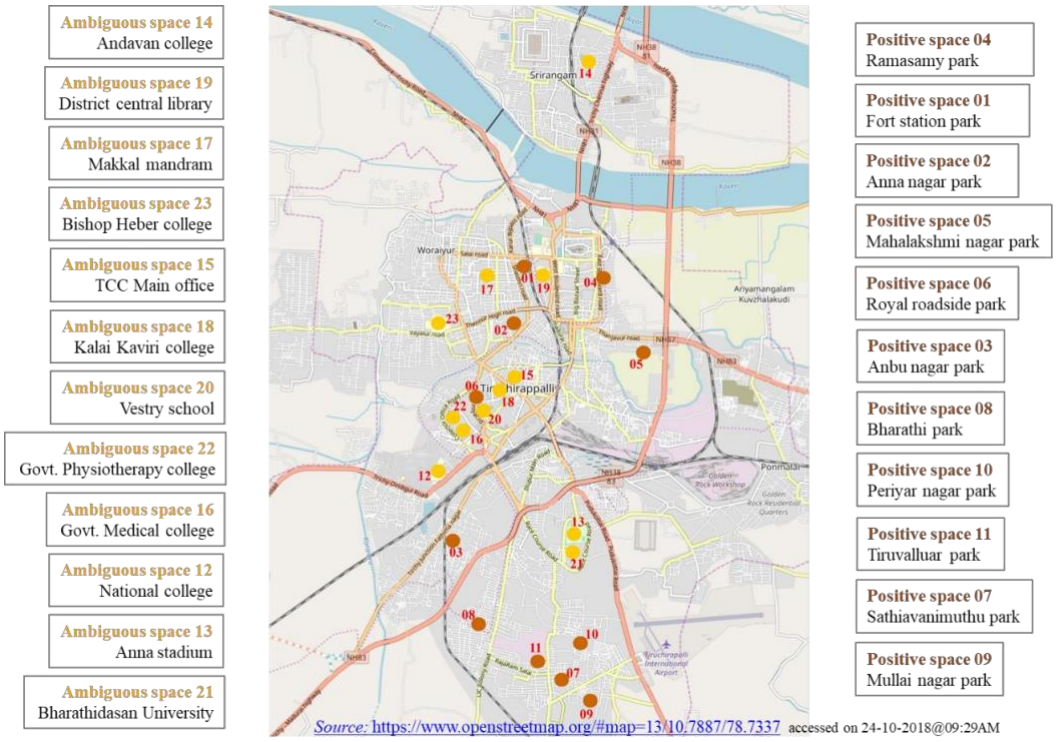


Table 4

Physical attributes of the boundary walls in the selected positive space types of Tiruchirappalli city, India.

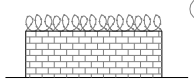
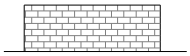
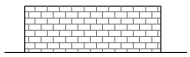
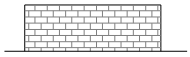
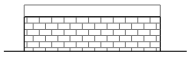
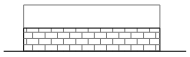
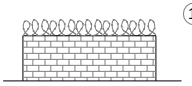
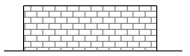
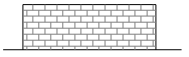
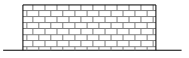
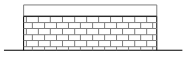
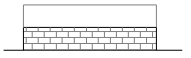
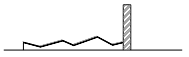
Physical features	①  Free-standing wall with deterring features	②  Only wall	③  Only spikes	
	Park: 01; 02; 05; 08; 09; 11	Park: 03; 04; 07	Park: 06; 10	
Surface uses	①  Non-enabling surfaces / Blank surfaces	③  Authorized and unauthorized surface uses	④  Surface uses by owner	⑤  Surface uses for public art
	Park: 03; 07; 08; 09	Park: 01	Park: 02; 06	Park: 04; 05; 10; 11
Visual access	①  Visually inaccessible	②  Less than one-fourth visual access	③  More than half visual access	④  More than three-fourth visual access
	Park: 07	Park: 01; 03; 08	Park: 02; 04; 06; 11	Park: 05; 09; 10
Presence of sidewalk	①  No sidewalk but open drain / left over space	③  No sidewalk but only road	⑤  Sidewalk present and is accessible to all	
	Park: 03; 04; 07; 08	Park: 01; 05; 06; 09; 10; 11	Park: 02	

Table 5

Physical attributes of the boundary walls in the selected ambiguous space types of Tiruchirappalli city, India.

Physical features	①  Free-standing wall with deterring features	②  Only wall		
	Park: 03; 04; 05; 07; 08; 09; 11; 12	Park: 01; 02; 06; 10		
Surface uses	①  Non-enabling surfaces / Blank surfaces	②  Unauthorized surface uses	③  Authorized and unauthorized surface uses	⑤  Surface uses for public art
	Park: 01; 07; 08; 12	Park: 02; 05; 06; 10; 11	Park: 03; 09	Park: 04
Visual access	①  Visually inaccessible	②  Less than one-fourth visual access	③  More than half visual access	
	Park: 01; 02; 06; 10; 11	Park: 03; 04; 05; 07; 09; 12	Park: 08	
Presence of sidewalk	②  Sidewalk present but broken and inaccessible	③  No sidewalk but only road	④  Sidewalk present but for pedestrians only	⑤  Sidewalk present and is accessible to all
	Park: 06	Park: 01; 03; 05; 07; 09; 11	Park: 08; 12	Park: 02; 04; 10

RESULTS

Physical features of the boundary walls and the perceived sociability of the adjoining space

In positive space types, the findings of one-way between-group analysis of variance [*F* (2, 492) = 32.225, *p* = 0.000] indicate significant differences between the three groups of physical features with respect to the perceived sociability of the adjoining space. Post-hoc comparisons using the Games-Howell test (Table 6) revealed that all three groups of physical features had significantly different mean scores for perceived sociability of the adjoining space. In ambiguous space types, the findings of the independent t-test (Table 6) indicated significant differences ($t_{(517)}$ = -7.317, p = 0.000) between the 'wall with deterring features' group (M=2.69) and the 'only wall' group (M=3.42) with respect to the perceived sociability of the adjoining space.

Surface uses of the boundary walls and the perceived sociability of the adjoining space

In positive space types, the findings of one-way between-group analysis of variance [*F* (3, 491) = 55.137, *p* = 0.000] indicate significant differences between the four groups of the surface uses with respect to the perceived sociability of the adjoining space. Post-hoc comparisons using the Games-Howell test (Table 7) revealed that the 'blank surfaces' group had a significantly different mean score as compared to the 'authorized and unauthorized surface uses' group and 'surface uses for public art' group, but not the 'surface uses by owner' group. The 'Surface uses by owner' group had a significantly different mean score than the 'authorized and unauthorized surface uses' group and 'surface uses for public art' group. In ambiguous space types, the findings of one-way between-group analysis of variance [*F* (3, 515) = 19.263, *p* = 0.000] indicate significant differences between the four groups of the surface uses with respect to the perceived sociability of the adjoining space. Post-hoc comparisons using the Games-Howell test (Table 7) revealed that 'surface uses for public art' group had a significantly different mean score than the other three groups, whereas 'unauthorized surface uses' group and 'authorized and unauthorized surface uses' group had mean scores that were significantly different from one another, but not from the 'blank surfaces' group.

Visual access condition of the boundary walls and the perceived sociability of the adjoining space

In positive space types, the findings of one-way between-group analysis of variance [*F* (3, 491) = 22.848, *p* = 0.000] indicate significant differences between the four groups of the visual access with respect to the perceived sociability of the adjoining space. Post-hoc comparisons using the Games-Howell test (Table 8) revealed that the 'visually inaccessible' group had a significantly different mean score than the other three groups, whereas the 'less than one-fourth visual access' group, 'more than half visual access' group and 'more than three-fourth visual access' group did not have significantly different mean scores. In ambiguous space types, the findings of one-way between-group analysis of variance [*F* (2, 516) = 19.645, *p* = 0.000] indicate significant differences between the three groups of the visual access with respect to the perceived sociability of the adjoining space. Post-hoc comparisons using the Games-Howell test (Table 8) revealed that all three groups of visual access had significantly different mean scores for perceived sociability of the adjoining space.

Presence of sidewalk and the perceived sociability of the adjoining space

In positive space types, the findings of one-way between-group analysis of variance [*F* (2, 492) = 8.762, *p* = 0.000] indicate significant differences between the three groups of the adjoining space condition with respect to the perceived sociability

of the adjoining space. Post-hoc comparisons using the Games-Howell test (Table 9) revealed significantly different mean scores between the 'no sidewalk but open drain' group and 'no sidewalk but only road' group, whereas the 'sidewalk present and is accessible to all' group has no significantly different mean scores. In ambiguous space types, the findings of one-way between-group analysis of variance indicate that sociable qualities of the adjoining space differ significantly in terms of the presence of sidewalks [F (3, 515) = 149.565, p = 0.000]. Post-hoc comparisons using the Games-Howell test revealed that the mean scores of all four groups were significantly different (Table 9).

Table 6

Differences in perceived sociability of the adjoining space with respect to the physical features (PF) of the boundary walls

<table>
<tr><td colspan="5">POSITIVE SPACES – One-way ANOVA and Post-hoc test comparisons (Games-Howell)</td></tr>
<tr><td colspan="2">F (2, 492) = 32.225, p = 0.000

PF group 01 (M = 3.48, SD = 0.912) _a
PF group 02 (M = 2.64, SD = 0.997) _b
PF group 03 (M = 3.12, SD = 1.100) _c</td><td colspan="3">• PF group 01 (n = 269) – Free-standing wall/fence with deterring features
• PF group 02 (n = 127) – Only wall
• PF group 03 (n = 99) – Only spikes</td></tr>
<tr><td colspan="5">AMBIGUOUS SPACES – Independent t-test</td></tr>
<tr><td>Group</td><td>Mean</td><td>Levene's 'p' value</td><td>t- value</td><td>df</td></tr>
<tr><td>PF group 01</td><td>2.69 _a</td><td rowspan="2">p= 0.09 (equal variance)</td><td rowspan="2">-7.317*</td><td rowspan="2">517</td></tr>
<tr><td>PF group 02</td><td>3.42 _b</td></tr>
<tr><td colspan="5">• PF group 01 (n = 337) – Free-standing wall/fence with deterring features
• PF group 02 (n = 182) – Only wall
* p value <0.05</td></tr>
</table>

Note. Means with the same subscript did not differ significantly from each other, whereas means with different subscript differ significantly from each other.

Table 7

Differences in perceived sociability of the adjoining space with respect to the surface uses (SU) of the boundary walls

<table>
<tr><td colspan="2">POSITIVE SPACES
One-way ANOVA and Post-hoc test comparisons (Games-Howell)</td></tr>
<tr><td>F (3, 491) = 55.137, p = 0.000

SU group 01 (M = 2.75, SD = 1.066) _a
SU group 02 (M = 3.58, SD = 0.819) _b
SU group 03 (M = 2.64, SD = 0.938) _a
SU group 04 (M = 3.78, SD = 0.713) _b</td><td>• SU group 01 (n = 157) – Non-enabling surfaces/blank surfaces
• SU group 02 (n = 53) – Authorized and unauthorized surface uses
• SU group 03 (n = 106) – Surface uses by owner
• SU group 04 (n = 179) – Surface uses for public art</td></tr>
<tr><td colspan="2">AMBIGUOUS SPACES
One-way ANOVA and Post-hoc test comparisons (Games-Howell)</td></tr>
<tr><td>F (3, 515) = 19.263, p = 0.000

SU group 01 (M = 2.76, SD = 1.120) _a
SU group 02 (M = 3.01, SD = 1.189) _{a, b}
SU group 03 (M = 2.56, SD = 0.988) _{a, c}
SU group 04 (M = 3.89, SD = 0.458) _d</td><td>• SU group 01 (n = 180) – Blank surfaces
• SU group 02 (n = 206) – Unauthorized surface uses
• SU group 03 (n = 78) – Authorized and Unauthorized surface uses
• SU group 04 (n = 55) – Surface uses for public art</td></tr>
</table>

Note. Means with the same subscript did not differ significantly from each other, whereas means with different subscript differ significantly from each other.

Table 8

Differences in perceived sociability of the adjoining space with respect to the visual access (VA) of the boundary walls

POSITIVE SPACES *One-way ANOVA and Post-hoc test comparisons (Games-Howell)*	
F (3, 491) = 22.848, *p* = 0.000	• VA group 01 (n = 51) – *Visually inaccessible* • VA group 02 (n = 117) – *Less than one-fourth visual access* • VA group 03 (n = 153) – *More than half visual access* • VA group 04 (n = 174) – *More than three-fourth visual access*
VA group 01 (M = 2.16, SD = 0.543) $_{a}$ VA group 02 (M = 3.26, SD = 1.094) $_{b}$ VA group 03 (M = 3.44, SD = 0.902) $_{b}$ VA group 04 (M = 3.22, SD = 1.038) $_{b}$	
AMBIGUOUS SPACES *One-way ANOVA and Post-hoc test comparisons (Games-Howell)*	
F (2, 516) = 19.645, *p* = 0.000	• VA group 01 (n = 215) – *Visually inaccessible* • VA group 02 (n = 249) – *Less than one-fourth visual access* • VA group 03 (n = 55) – *More than half visual access*
VA group 01 (M = 3.26, SD = 1.109) $_{a}$ VA group 02 (M = 2.82, SD = 1.118) $_{b}$ VA group 03 (M = 2.31, SD = 0.940) $_{c}$	

Note. Means with the same subscript did not differ significantly from each other, whereas means with different subscript differ significantly from each other.

Table 9

Differences in perceived sociability of the adjoining space with respect to the presence of sidewalk (SW) abutting the boundary walls

POSITIVE SPACES *One-way ANOVA and Post-hoc test comparisons (Games-Howell)*	
F (2, 492) = 8.762, *p* = 0.000	• SW group 01 (n = 159) – *No sidewalk but open drain* • SW group 02 (n = 283) – *No sidewalk but only road* • SW group 03 (n = 53) – *Sidewalk present and is accessible to all*
SW group 01 (M = 2.94, SD = 1.092) $_{a}$ SW group 02 (M = 3.35, SD = 0.976) $_{b}$ SW group 03 (M = 3.06, SD = 1.008) $_{a, b}$	
AMBIGUOUS SPACES *One-way ANOVA and Post-hoc test comparisons (Games-Howell)*	
F (3, 515) = 149.565, *p* = 0.000	• SW group 01 (n = 33) – *Sidewalk present but inaccessible* • SW group 02 (n = 228) – *no sidewalk but only road* • SW group 03 (n = 101) – *Sidewalk present but for pedestrians only* • SW group 04 (*n* = 157) – *Sidewalk present and is accessible to all*
SW group 01 (M = 1.67, SD = 0.479) $_{a}$ SW group 02 (M = 2.78, SD = 1.081) $_{b}$ SW group 03 (M = 2.10, SD = 0.768) $_{c}$ SW group 04 (M = 4.01, SD = 0.408) $_{d}$	

Note. Means with the same subscript did not differ significantly from each other, whereas means with different subscript differ significantly from each other.

DISCUSSION

The necessity for this study emanated from the limited scholarly attention directed towards understanding the significance of the physical attributes of boundary walls in influencing the perceived sociability of the adjoining space. Boundary walls are an important aspect in the revamping of public spaces in Tiruchirappalli city (Times of India, 2019). However, the absence of systemic knowledge of how to approach physical boundaries has led to ad hoc material renovation. Further, due to the growing predominance of public-private partnerships in conceptualizing and managing public spaces (Carmona, 2010; Karthik, 2019), investigation of the impact of boundary walls of positive and ambiguous space types in Tiruchirappalli city, such as that carried out in this study, is of increasing importance. The results of this study are discussed in the light of the enabling capacity of the physical attributes of boundary walls that enable to produce inside and outside spaces by directly acting on bodies by providing facilitating surfaces for content creation and communication, by offering visual permeability, and by creating an outward sphere of influence that extends into abutting spaces.

Physical features of the boundary walls in positive and ambiguous space types

In positive space types, of the eleven selected parks that are representative of the varying types of physical features of boundary walls, six parks have deterring features, three parks have only walls, and two parks have only spikes (Table 4). Consideration of the degree of influence between the three types of physical features found in the selected parks of Tiruchirappalli city indicates that they are distinct in provoking the sociable qualities of the adjoining space, which can be due to their subliminal attention/warning, and also due to variations in the intensity of boundary conditions defining the level of invitation and approachability of the adjoining space. The potential of the adjoining space to enable various activities is guided by the controls installed by property owners, some of which are extremely deterring features such as barbed wire and glass pieces, which are intended to deter activities emanating from the abutting spatial and material conditions (Figure 1, Figure 2). Even though the presence of deterring features is uninviting and unpleasant, their predominance indicates the subliminal notion of safety and security associated with boundary walls, and, due to their interstitial nature, they do become material support for the external activities.

Of the twelve selected ambiguous space types, the boundary walls of eight ambiguous space types have deterring features installed, and four ambiguous space types have only walls (Table 5). Their potential to affect the adjoining space in terms of unfriendly-sociable qualities is related to their capacity to exert control and generate a sense of discomfort, as compared to the presence of only blank walls. The absence of deterring features of boundary walls indicates an inviting attitude that can enable formation of activities. The intensity of physical features signifies not only demarcation and discouragement, but also insulation and material support (Figure1, Figure 2). Further, the physical features of the boundary wall are read by users not only as deterring features, but also as representative materials that inform the intentions of being the least disturbing, acceptable, and supportive qualities to be maintained in the adjoining space for the property owners and their enclosed spatial functions. Since ambiguous space types are characterized by private ownership, a sense of control and deterrence is conveyed by the installation of deterring features, which are subsumed as safety and security concerns. It should be noted that installation of deterring features is a property right that is exercised as a preemptive material condition, necessary to maintain the safety, security, and sanctity of the enclosed space by owners. These results indicate that, irrespective of the space types, physical features of the boundary walls are perceived as significant elements that influence the sociable-unfriendly quality of the adjoining space.

Surface uses of the boundary walls in positive and ambiguous space types

In positive space types, of the selected eleven parks, four parks have boundary walls with blank

surfaces, four parks have boundary walls with surfaces used for public art purposes, two parks have boundary walls with surfaces used by the owner, and one park has boundary wall with surfaces subjected to authorized and unauthorized uses (Table 4). The results indicate that blank surfaces and surfaces used by owners perform a distinct role in addressing the perceived sociability of the adjoining space, which can be due to the presence of controls. In the case of blank surfaces, even though they convey extension of control and are uninviting and unpleasant, their potential to be used for public art purposes can always be realized, a point repeatedly expressed by the respondents during the survey as under-utilization of boundary wall surfaces. Parks are under public ownership. As part of enhancing the user experience, Anna Nagar Park has been conceptualized as a science park in Tiruchirappalli city, with various amenities for all age groups, while Royal Roadside Park has been identified as a pilot park for implementing the concept of maintenance by private entities (Karthik, 2019). The surfaces of the boundary walls of both Anna Nagar Park and Royal Roadside Park are embedded with graphic objects pertaining to city corporation (Figure 4).

Based on the materiality of boundary walls and their locational characteristics with respect to visibility spheres, the possibility of using boundary wall surfaces for authorized and unauthorized purposes also exists, particularly in the form of graphic objects by the city corporation, and the display of posters and fliers by various commercial and political organizations, affecting the social and visual functions of the surfaces of boundary walls. However, as part of beautification drive of the Tiruchirappalli city, the boundary wall surfaces of parks have been used for public art purposes. The results of this study also indicate that authorized and unauthorized surface uses, and surface uses for public art have commonalities in addressing the perceived sociability of the adjoining space, which may be due to their presence in spaces of high visibility with varying levels of control. The four parks with boundary wall surfaces used for public art purposes, and the one park with boundary wall surfaces subjected to authorized and unauthorized uses have been recently developed with attractive amenities (Table 4, Figure 4). While the use of surfaces for public art aims to attract and engage people, whereas the presence of authorized and unauthorized surface uses is indicative of the visibility levels and potential for activity spots, both types of surface usage contribute to the evolution and transformation of the adjoining spaces of the parks as socializing spaces and potential activity lines for street vending. The uses of the boundary wall surfaces are intended to communicate with the public in various ways. Posters, fliers, and advertisements aim to promote, whereas public art aims to stimulate/induce awareness or aesthetic responses. Different surface uses indicate varying capacities of public address, either by intensity of use or by intention to engage, contributing to unfriendly and sociable qualities of the adjoining space.

Among the selected twelve ambiguous space types, five spaces have boundary walls subject to unauthorized surface uses, four spaces have boundary walls with blank surfaces, two spaces have boundary walls subject to both authorized and unauthorized surface uses, and the surfaces of the boundary walls of one space are used for public art purposes (Table 5). Users perceive the presence of artwork as not only engaging and beautiful, but also as enhancing the quality of immediate spaces (given the fact that any such development programs that are focused on developing aesthetic qualities of spaces tend to maintain the space free of physical incivilities). The results also indicate that the presence of surfaces used for public art purposes is significant in influencing the perceived sociability of the adjoining space. Ambiguous spaces are predominantly characterized by boundary walls being subjected to unauthorized surface uses and blank surfaces; the former indicates the visibility spheres, while the latter indicates the presence of control beyond the highly maintained boundary conditions and into the adjoining spaces that are considered to be subliminally associated with the projected image of the enclosed space. However, these results also indicate that blank surfaces, unauthorized surface uses, and authorized and unauthorized surface uses are not significant for the users with respect to the perceived sociability of the adjoining space. This can be due to the varying types of spatial functions that attract and generate various secondary supportive functions that convey lack of control or the presence of discouraging conditions in the adjoining space

(Figure 1, Figure 2). The presence of blank surfaces implies the conscious decision of the owner to maintain the boundary conditions in a desired manner, or neglect in realizing the unused potential of the boundary wall surfaces, whereas the presence of authorized and unauthorized surface uses implies the role of boundary wall surfaces as potential sites for public visibility. These results correspond with past studies which found that boundary wall "surfaceality" is a form of mediated interaction between people, content and space (Brighenti, 2009, p. 65; Hoek, 2016). In this regard, this study also reveals that the surface uses of boundary walls are not limited by ownership conditions, evident in the varying types of surface uses and their ownership status (Table 2).

Visual access of the boundary walls in positive and ambiguous space types

In positive space types, of the eleven selected parks, four have boundary walls with more than half visual access condition, three have boundary walls with more than three-quarters visual access, three have boundary walls with less than one-quarter visual access, and one has boundary walls with no visual access (Table 4). The park with no visual access is one of the newly revamped parks in Tiruchirappalli city (Park 07 in Figure 4). Visual accessibility of boundary walls is an important attribute that aids in enhancing the presence of a park as being more visible, inviting, and pleasant. However, the non-visibility of the amenities and the greenery of the parks with low visual access conditions was a point of concern that was repeatedly expressed by the respondents during the survey.

The degree of influence of the four types of visual access conditions indicates that even though the visually inaccessible condition implies obstruction of visual interaction, it also encourages formation of activities in the adjoining space, leading to its distinct role in addressing the perceived sociability of the adjoining space, whereas the other three types of visual access conditions imply not only scope for visual interaction, but also visual control, leading to commonalities in addressing the perceived sociability of the adjoining space. The significant difference in the visually inaccessible condition of the boundary wall with other visual access conditions reinforces the fact that visual insulation plays an important role in the perceived sociability of the adjoining space. However, the results indicate that parks with visual access conditions are not significant in evoking perceived sociability of the adjoining space. This finding provides a basis for understanding the limitations of the higher visual access conditions of boundary walls. The significance of visual inaccessibility is indirect evidence of the presence of material support for various activities (Figure 2). Even though this study does not focus on evaluating the level of activities in the adjoining spaces, it brings forward the influence of the varying visual access conditions of boundary walls on the perceived sociability of the adjoining space.

Of the twelve ambiguous space types, six spaces have boundary walls with less than one-quarter visual accessibility, five spaces have boundary walls with no visual accessibility, and one space has boundary walls with more than half visual accessibility (Table 5). Ambiguous space types are predominantly characterized by boundary walls that are visually inaccessible or have less than one-quarter visual accessibility. These results reveal that the differences in visual access conditions of the boundary walls influence the perceived sociability of the adjoining space. The varying degrees of visual connections and visual disconnections imply the intensity of interactions and intensity of insulation. Visually inaccessible conditions indicate a complete separation of inside and outside activities, whereas some minor scope for visual connections implies a certain degree of necessity to connect with external public space. Visually inaccessible conditions of boundary walls do not connect inside and outside spaces, but their bland nature strongly demarcates and insulates spaces. Further, this result also indicates that varying levels of visual access conditions of boundary walls are driven by the ownership and functions of the enclosed spaces (Table 2).

Presence of sidewalk in positive and ambiguous space types

In positive space types, of the eleven selected parks, six have no sidewalks, but only roads as an adjoining space condition; four parks have no

sidewalk, but do have open drains/left over space, and one park has a sidewalk that is accessible to all (Table 4). The degree of influence of the three types of adjoining space conditions indicates that *no sidewalk but open drain* and *no sidewalk but only road* perform distinct roles in addressing the perceived sociability of the adjoining space, whereas *sidewalk that is present and is accessible to all* has commonality with the other two types of adjoining space conditions.

These results indicate that safety conditions are more critical to perceived sociability than the presence of sidewalks. The two scenarios of *having no sidewalk but open drain/left over space* and *having only road* are indicative of dangerous conditions such as traffic dangers, and the risk of falling into the drain (which was repeatedly emphasized by the survey participants). Further, since Anna Nagar Park is one of the prime parks, also known as the science park in Tiruchirappalli city, it attracts a high number of street vendors, diminishing the scope for appreciating the presence of the sidewalk that is accessible to all. Since Tiruchirappalli city is being developed as a smart city, sidewalks as public spaces are being provided and revamped; however, the feasibility of providing sidewalks for all the parks may be affected by the varying spatial conditions that are either sociable or unfriendly. The presence of open drains or of having only road access are distinct conditions of adjoining spaces that expose pedestrians to risk, but they are also adapted for constrained movement and opportunities. The pending installation of sidewalks as infrastructure needs to be realized for its advantages and the extent of opportunities it can provide (Indian Road Congress, 2012).

In ambiguous space types, of the twelve selected spaces, six have no sidewalk but only road as the adjoining space condition; three spaces have a sidewalk that is accessible to all; two spaces have a sidewalk that is for pedestrians only, and one space has a sidewalk that is broken and inaccessible as the adjoining space condition (Table 5). It is evident that ambiguous space types are predominantly characterized by the absence of sidewalks and the presence of roads only. The results indicate that users perceive the provision of infrastructure as a significant condition for the sociability of the adjoining space separated by boundary walls. Further, this result also brings forward the point that public ownership does not equate with the idea of accessibility to all (Table 2).

Figure 4

Images showing the boundary walls and adjoining space conditions of the selected positive space types in Tiruchirappalli city, India.

Figure 5

Images showing the boundary walls and the adjoining space conditions of the selected ambiguous space types in Tiruchirappalli city, India.

Ambiguous space - 01

Ambiguous space - 02

Ambiguous space - 03

Ambiguous space - 04

Ambiguous space - 05

Ambiguous space - 06

Ambiguous space - 07

Ambiguous space - 08

Ambiguous space - 09

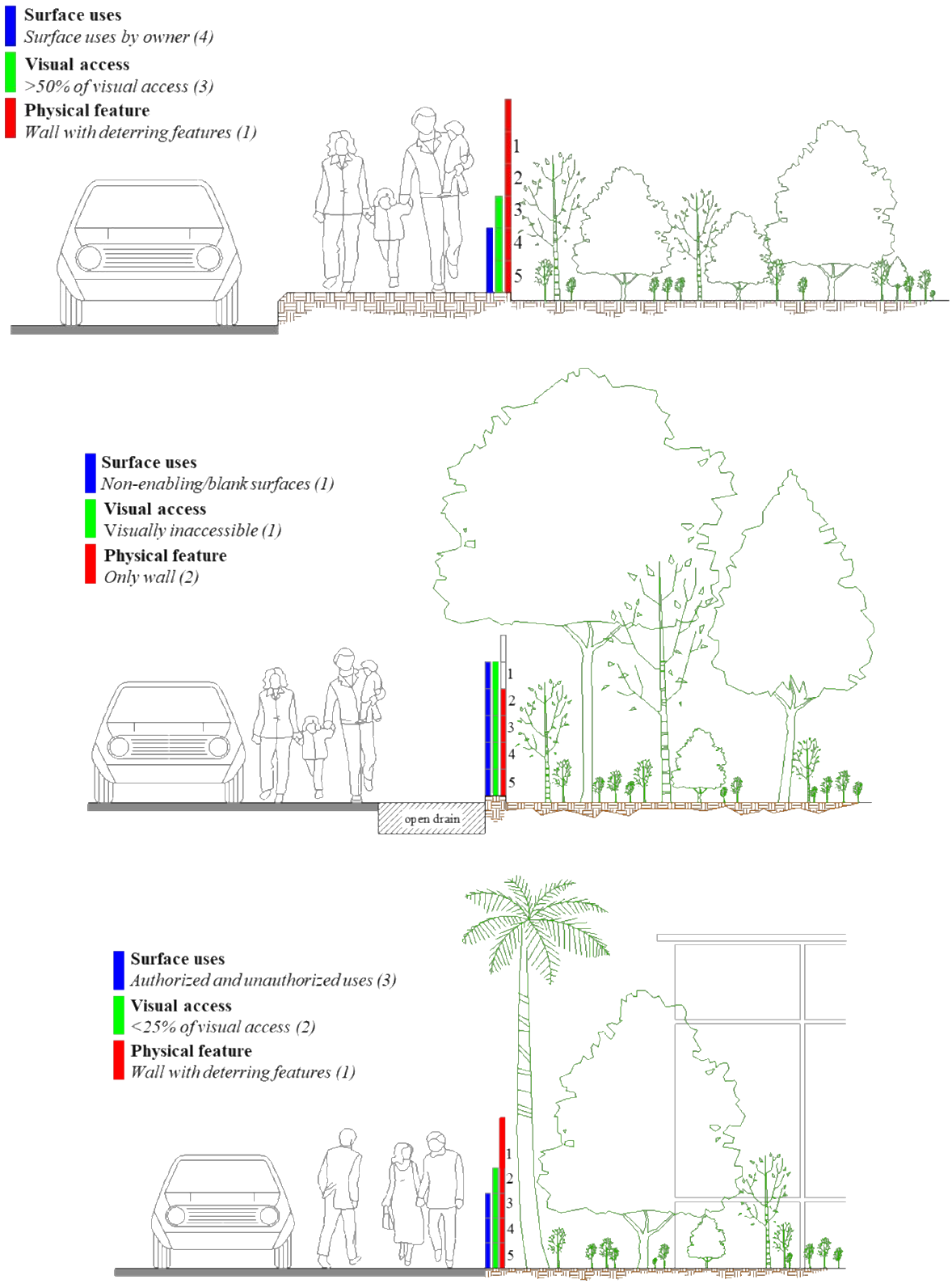
Ambiguous space - 10

Ambiguous space - 11

Ambiguous space - 12

Figure 6

Representative sections of the selected boundary walls of positive and ambiguous space types with varying physical attributes and adjoining space conditions



CONCLUSION

Given the limited understanding of the role of the physical attributes of boundary walls in enabling and disabling the sociable qualities of the adjoining public spaces, this study has revealed that physical features, surface uses, visual access, and presence of sidewalks significantly influence the perceived sociability of the adjoining space (Figure 6). The materiality of boundary walls is socially constructed, whose meaning is instilled "through production and use by humans" (Madanipour, 2003, p. 210; Rashid, 1998). In Tiruchirappalli city, the positive space types are predominantly characterized by boundary walls with deterring features, blank surfaces, surfaces used for public art purposes, more than half visual access, and adjoining space with no sidewalks but only roads. Given the varying physical attributes of boundary walls, their significant influence on the perceived sociability of the adjoining space in positive space types is not only due to their enabling and disabling capacities, but is also guided by the presence of city level development initiatives. However, the limited understanding of the role of park boundary walls is clear in the lack of consistent installation of boundary walls with similar physical attributes across various parks, indicating a lack of conceptual thinking in the design of boundary walls by officials and professionals, except for the use of boundary wall surfaces for public art purposes.

Ambiguous space types are characterized by boundary walls with deterring features, unauthorized surface uses, less than one-quarter visual access, and adjoining space with no sidewalks but only roads. Given the varying physical attributes of boundary walls, their significant influence on the perceived sociability of the adjoining space in ambiguous space types is guided not only by the ownership's expressions of control, but also the functional necessities of insulating the enclosed space from the adjoining activities. However, the contribution of the presence of sidewalk towards enhancing the quality of public spaces is visible in selected space types, although it is subject to the provision of sidewalks as part of public space infrastructure. Even though ambiguous space types differ by ownership and function, the design of boundary walls by professionals is indicative of a lack of understanding of the role of boundary walls in enhancing the publicness of public spaces. As an architectural element, a boundary wall is "a plunge into a field of social relations in which it brings about some specific effects" (Foucault, 1984, p. 253). However, as Madanipour (2003, p. 142) suggests, the responsibility of designers is "the development of social relationships rather than merely accepting the alienation of the crowds".

Even though boundary walls and their adjoining spatial conditions are deeply context specific, the recommendations resulting from this study are: In positive space types, even though complete visual accessibility is inviting, the fear of unexpected encounters is inherent to public open space users, which needs to be addressed by providing sidewalks, promoting surfaces used for public art purposes, and discouraging the presence of deterring features, thus enhancing the sociable quality of the adjoining space. Ambiguous space types are defined by ownership and the functional extent of the enclosed space, indicating varying levels of visual access conditions. Since provision and improvement of sidewalks in Tiruchirappalli city are of high priority, the recommendations resulting from this study also focus on the overall enhancement of public spaces, since users experience built environments as "ensembles" rather than individual units (Carmona et al., 2003, p. 131). In this regard, the dynamic quality of successful public spaces needs to be channeled through progressive policies that enable provision of accessible infrastructure (sidewalks) leading to diversity of users (Loukaitou-Sideris & Ehrenfeucht, 2009; Montgomery, 1998).

The results of this study provide a glimpse into the enabling and disabling capacities of the physical attributes of boundary walls. In this regard, studies across varying contextual conditions are required to generalize the role of boundary walls in contributing to the perceived sociability of the adjoining spaces. Apart from the contextual conditions, the fact that a majority of the survey respondents were male, and the non-inclusion of questionnaire survey responses from architects and officials comprise the limitations of this study. Future research could include temporal diversity of uses, users, and activities in the adjoining public spaces from both global north and global south contexts.

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